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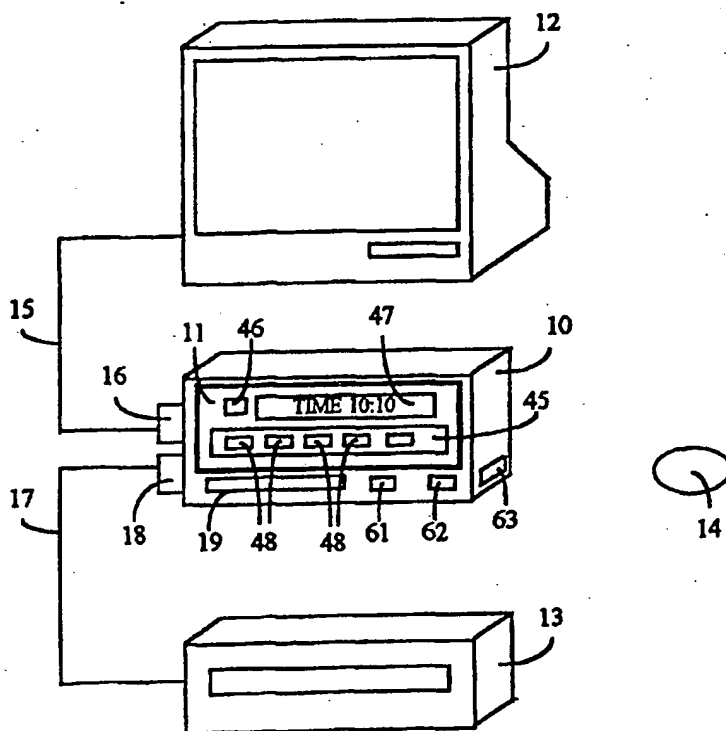
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G11B 19/02, 19/00, 19/06, 19/12, 31/00		(11) International Publication Number: WO 96/38841
A1		(43) International Publication Date: 5 December 1996 (05.12.96)
(21) International Application Number: PCT/IT96/00101		(81) Designated States: AU, CA, CN, JP, KR, US, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
(22) International Filing Date: 17 May 1996 (17.05.96)		
(30) Priority Data: TO95A000434 29 May 1995 (29.05.95) IT		
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(54) Title: **ELECTRONIC COMPUTER HAVING A MAGNETO-OPTIC UNIT**

(57) Abstract

This invention refers to an electronic computer (10) having a reader (21) for the reading of removable magneto-optic media (CD-ROM) (14). The electronic computer (10) allows even non-expert users to playback the CD-ROM media by pressing pushbuttons (48) on a button panel (45) and visualises on a display (47) information concerning the type of CD-ROM inserted in the reader (21) and the functionality selected. The electronic computer (10) is also capable of passing automatically from an operating state of maximum performance to one of reduced performance with a resultant reduction in electrical energy consumption. The electronic computer (10) can also be connected to television sets (12) and to video recorders (13). The computer (10) according to this invention, while possessing the functionality described above, still remains flexible, powerful, and upgradable, which are attributes typical of personal computers.



"ELECTRONIC COMPUTER HAVING A MAGNETO-OPTIC UNIT"**TECHNICAL FIELD**

This invention refers to an electronic computer for handling magneto-optic media, comprising a central processing unit, a reading unit connected to the central processing unit for reading data pre-recorded on a removable
5 recording medium of different type, and a display unit. More precisely, this invention refers to an electronic computer for the handling of optical type compact disks (CD-ROM).

BACKGROUND ART

10 Personal computers are known in the current art that are used to read and playback optic and/or magnetic media. These computers, one of which is the Applicant's PCS Educator, use either a keyboard or a pointing device, commonly known as a "mouse", to activate the read and playback functionality of the CD-ROM and have the Personal Computer's monitor as their visual
15 display device.

Also known in the current art is the use of commercial appliances, known as CD-players, to read and playback CD-ROM's. These appliances provide for actuation of the various controls by means of a plurality of pushbuttons, each with a predefined functionality, and have a television set as their visual display
20 device.

The known computers, though they allow reading and playing of CD-ROMs, are of limited performance with respect to the commercial CD-players insofar as they are not apt for reading and playback of all the types of CD-ROM available on the market, nor for use of the television as the preferential visual
25 display device, nor for connection to other magnetic media playback devices, such as video recorders for example. Further, the known computers are difficult for non-expert users to use as they require utilisation of devices, such as the keyboard or mouse, with which domestic users are unfamiliar.

On the other hand, though the CD-players are easy to use, they can only read
30 and playback CD-ROMs and cannot perform any other processing work. In addition, these devices have the drawback that they are not upgradable, so that their performance cannot be improved upon nor can their characteristics be enhanced, for example following introduction of a new type CD-ROM.

SUMMARY OF INVENTION

The purpose of this invention is that of presenting an electronic computer which, though remaining highly flexible, powerful and upgradable, allows users to select and actuate the various CD-ROM read and playback functions both easily and immediately.

In accordance with this purpose, the electronic computer, according to the present invention, is characterised by a console having a plurality of functional elements selectively actuatable for activating/deactivating the functions of the reading unit, and by control means connected to the plurality of functional elements, to the central processing unit and to the display unit for causing the display unit to display information relating to the selected functions of the reading unit.

According to a further characteristic of this invention, the electronic computer is characterised by the fact that it has automatic means for the control of its electric power supply, which are suitable for generating, after a predetermined time or following depression of a given pushbutton, a switching signal that results in switching from a operating state of full performance, accompanied by a greater consumption of electricity, to a stand-by state of operation where less electricity is consumed.

According to a further characteristic of this invention, the electronic computer is provided with communication means that may be controlled by the central processing unit and can be connected to a television or to a video recorder unit to visualise the contents of the CD-ROMs or the data processed by the computer on the television and/or to record the above-mentioned contents or data on the video recorder.

BRIEF DESCRIPTION OF DRAWINGS

This and other characteristics of the present invention will become apparent when the following description of a preferred embodiment, provided by way of a non-exhaustive example, is considered in conjunction with the accompanying drawings, in which:

Fig. 1 represents a general diagram of the electronic computer according to the present invention;

Fig. 2 represents a block diagram of the computer of Fig. 1;

Fig. 3 represents a block diagram of the console of the computer of Fig. 2; and

Fig. 4 is an enlarged scale view of the console of Fig. 3.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

5 With reference to Fig. 1 and Fig. 2, an electronic computer 10, according to the present invention, comprises a motherboard 20, a reader 21 for magneto-optic disks (CD-ROM) 14, a console 11, a speaker device 22 and a hard disk type memory unit (HDU) 23.

Electronic computer 10 further comprises a video interface logic (SCART
10 controller) 35 and a series of known type connection sockets 61, 62 and 63, apt to be connected respectively to a keyboard, a mouse and a monitor, not shown on the drawings.

Reader 21, console 11, speaker 22, HDU 23, SCART controller 35 and the
15 series of sockets 61, 62 and 63 are connected to a data channel 33 of motherboard 20.

Motherboard 20 comprises a central processing unit (CPU) 30 and both a random access memory (RAM) 32 and a read only memory (ROM) 31, both connected to CPU 30.

Motherboard 20 may be comprised, for example, of a motherboard for
20 Personal Computer and is suitable for processing programs recorded on HDU 23 and reading, through reader 21, data pre-recorded on CD-ROMs 14, which may be of the AUDIO, PHOTO, VIDEO or DATA types. Reader 21 comprises a slot 19 in which CD-ROMs 14 are capable of being removably inserted.

Console 11 comprises a display unit 47 suitable for the display of messages
25 and a button panel 45, having a plurality of pushbuttons 48 suitable to be activated to transmit predefined commands to the CPU 30, either along data channel 33 or through two lines 51 and 52.

SCART controller 35 is apt to be connected to a television set 12 and a video recorder 13, both known in the current art, by means respectively of SCART
30 plugs (16 and 18) and cables (15 and 17) and is apt to transmit the data read by reader 21 to television set 12 and/or video-recorder 13 for playback.

SCART controller 35 is also apt to transmit, in a known way, audio and video signals from video recorder 13 to television set 12.

ROM 31 is suitable for storing the firmware programs, developed during the design stage of motherboard 20, and comprises two areas (31a and 31b) in which the instructions are stored that cause electronic computer 10 to execute given functions that will be described later in detail.

5 RAM 32 comprises an area 32a in which information from the CD-ROM inserted in reader 21 is apt to be stored, as will be described later in detail.

CPU 30 which is constituted, for example, by a 486SL microprocessor produced by INTEL Inc., is suitable for supporting a protected type system management feature called "Protect and System Management Mode", already
10 described in Patent Application No. TO95A000122, filed on 21st February 1995 by the Applicant. This feature is originated by a System Management Interrupt signal, hereinafter simply "SMI", and is characterised by the fact that CPU 30, once it receives the SMI signal, suspends current activity, handles the instructions provided for in the motherboard 20 design stage and stored in
15 ROM 31 concerning the SMI signal received, before returning to regular activity as if the interrupt had never happened.

Console 11 comprises a microchip 40 (Fig. 3) to which button panel 45, display 47 and a light-emitting diode (LED) 46 are connected.

Microchip 40 is constituted, for example, by the 75268 MICROCHIP produced
20 by Nippon Electric Corporation and comprises a central processing unit (CPU) 43, a read only memory (ROM) 41, suitable for recording programs developed in the console 11 design stage, and a random access memory (RAM) 42.

Console 11 is suitable for transmitting CPU 30, through line 52, the SMI signal and consequently institute Protect and System Management Mode.

25 Console 11 is also suitable for transmitting, through line 51, an interrupt signal INT causing CPU 30 to suspend, in a known way, its activity in expectation of input/output data (I/O) directed by console 11 to data channel 33.

Button panel 45 comprises a plurality of function buttons 48, such as "PLAY", "PAUSE", "FAST FORWARD", "REWIND" and "STOP" commonly used on
30 commercial type appliances, video recorders and CD-players for example, and is suitable for transmitting predefined signals to microchip 40, preferably by depressing one or more pushbuttons 48 in combination. One button 49 of

button panel 45 (stand-by button) is suitable for transmitting the SMI signal to motherboard 20.

Operation of the electronic computer 10 described up to this point is as follows.

5 As is known, CD-ROMs are formatted in such a way as to include a "Lead-in area" in which the table of contents (TOC) is stored, containing the number of tracks used, total playing time and, for each track, both the type of information recorded and the address of the track on the CD-ROM. In another area of the CD-ROM, indications are recorded (VTOC) on the CD-ROM Directory
10 structure, such as an index, names and dimensions of the data files. These indications are not featured on the CD-AUDIO media.

The specifications concerning data formatting on the CD-ROMs are described in standard manuals, named after the colour of the cover; for example, the CD-AUDIO specifications are described in the RED-BOOK, the DATA CD-
15 ROM specifications are described in the YELLOW-BOOK, and so on.

Following insertion by a user of a CD-ROM 14 in slot 19 (Fig. 1), reader 21 (Fig. 2) sets CD-ROM 14 in rotation in a known way, reads the TOC area (Table Of Contents) and VTOC area (Volume Table Of Contents), if present, of CD-ROM 14 and transmits CPU 30 a message suitable for signalling that
20 insertion has been made.

CPU 30 interprets the message received and transfers the data read by reader 21 to area 32a of RAM 32.

The data transferred to area 32a of RAM 32 are then compared with those stored in area 31a of ROM 31 in order to identify the type of CD-ROM 14
25 inserted.

Once the type of CD-ROM 14 inserted has been identified, CPU 30 transmits console 11, through data channel 33, I/O signals indicating what type of CD-ROM 14 has been inserted and other related information.

Microchip 40 (Fig. 2 and Fig. 3), upon reception of the I/O signals from CPU
30 30, drives display 47 so that messages corresponding to the type of CD-ROM 14 inserted in reader 21 are displayed and enables button panel 45 to enter commands in order to activate playback of the CD-ROM 14 inserted.

The following tables illustrate the function associated with each button 48 and the messages appearing on display 47, in relation to the type of CD-ROM 14 inserted in reader 21.

TABLE 1

AUDIO-CD

OPERATING CONDITIONS :	MESSAGE DISPLAYED :
On recognition of the CD	CD AUDIO TOTAL TIME (MM:SS) TRACK (nnn)
After recognition of the CD	TRACK (nnn) CD AUDIO
Play	> TRACK (nnn) TIME (MM:SS)
Pause	 TRACK (nnn) TIME (MM:SS)
Stop	TRACK CD AUDIO
FF	TRACK (nnn) > > TIME (MM:SS)

RW	TRACK (nnn) < < TIME (MM:SS)
FF Scan	SCAN > > TRACK (nnn)
RW Scan	SCAN < < TRACK (nnn)

TABLE 2

PHOTO CD

OPERATING CONDITIONS :	MESSAGE DISPLAYED :
On recognition of the CD	PHOTO CD PICTURE (nnn)
Play/Autoplay	PICTURE (nnn) NEXT (nnn+1) Autoplay button blinking
Pause	 PICTURE (nnn) NEXT (nnn+1)
Stop	
FF	> > PICTURE (nnn) NEXT (nnn+1)
RW	< < PICTURE (nnn) NEXT (nnn+1)

TABLE 3
VIDEO CD

OPERATING CONDITIONS :	MESSAGE DISPLAYED :
On recognition of the CD	VIDEO CD TOTAL TIME (MM:SS)
Play	> (MM:SS)
Pause	 (MM:SS)
Stop	VIDEO CD
FF	>> (MM:SS)
RW	<< (MM:SS)

For example, if an AUDIO-CD type CD-ROM 14 is inserted in reader 21, the markings "CD" and "AUDIO" are lit on display 47 and also a message indicating the total playback time and the number of tracks recorded; furthermore, button panel 45 is enabled so that its pushbuttons 48 can command sound playback of the tracks.

Following depression of one of the buttons 48 of button panel 45 (Fig. 3), the "PLAY" button for example, a predefined signal is transmitted to microchip 40 where it is interpreted by CPU 43, on the basis of the settings recorded in the ROM 41 design stage, and converted into an interrupt signal INT for transmission to CPU 30 (Fig. 2), through line 51, and into an I/O signal for transmission to data channel 33 of motherboard 20.

CPU 30 thus commands reading and playback of CD-ROM 14 on the basis of predefined programs, memorised in RAM 32.

For example, if the CD-ROM 14 is AUDIO-CD type, the data read by the reader 21 are processed and transferred in a known way, through data channel 33, to speakers 22 for amplification and playback.

If the CD-ROM is PHOTO-CD type, the data read are processed and transferred in a known way to SCART controller 35 which, depending on the user-defined parameters stored in RAM 32, transmits the data to television 12, through socket 16 and cable 15 (Fig. 1), and/or to video recorder 13 through socket 18 and cable 17.

If CD-ROM 14 is VIDEO CD type, the data read are processed and transferred in a known way to SCART controller 35 (Fig. 2) and to speakers 22 for playback.

It will be clear that electronic computer 10 described up to here is suitable for recognising in an automatic way the type of magneto-optic medium 14 inserted in the reader 21 and for arranging for playback of the media 14 simply through depression of buttons 48 (Fig. 4).

It will also be clear that all the images displayed on television 12 may also be transmitted to video recorder 13 for recording.

Following playback of the different kinds of CD-ROM, or if button panel 45 or reader 21 (Fig. 2) remain inoperative for a predetermined period of time, CPU 43 (Fig. 3) transmits the SMI signal to CPU 30 (Fig. 2).

CPU 30, on receiving said signal, reads the predefined instructions in area 31b of ROM 31 and transmits, through data channel 33, commands suitable for suspending the activities of the peripheral units connected to motherboard 20 such as, for example, reader 21 and HDU 23. CPU 30 also transmits I/O signals to microchip 40 (Fig. 3) commanding LED 46 to light (Fig. 4), indicating the inoperative state of electronic computer 10 (Fig. 2).

In this way, after a predefined time ranging from some tens of seconds to a few minutes, electronic computer 10 automatically goes into a condition of reduced activity or stand-by during which the consumption of electrical energy is greatly reduced.

Only depression of a button 48 (Fig. 4) on button panel 45 or insertion of a new CD-ROM 14 in slot 19 (Fig. 1) can restore normal operating conditions. In actual fact, following depression of a button 48 (Fig. 3), for example, a signal is transmitted to microchip 40 that can send the SMI signal to CPU 30 (Fig. 2) which, having read the predefined instructions in area 31b of ROM 31, activates the peripheral units previously de-activated.

In parallel with signal SMI, CPU 43 also transmits an interrupt signal INT along line 51 and a corresponding I/O signal to data channel 33 (Fig. 2) which make CPU 30 execute the function corresponding to the button 48 (Fig. 1) actuated.

Activation and de-activation of electronic computer 10 may be achieved in a similar manner to the above through depression of stand-by button 49 (Fig. 3) which is apt to transmit the SMI signal to CPU 30 by means of microchip 40 (Fig. 2).

Even in the electronic computer 10 stand-by condition (Fig. 2), the connection between plug 18 and plug 16 through SCART controller 35 is still good so that it is always possible to display ribbon tapes played by video recorder 13 on television 12 (Fig. 1).

In a further configuration of electronic computer 10 button panel 45, instead of being fitted on the computer basic structure, may be provided on a free-standing remote control device and be suitable, in this case, for transmitting remotely the signals corresponding to the predefined functions of button panel 45.

In yet another configuration, electronic computer 10 can be connected by means of connectors 61 and 62 to a keyboard and a known type of mouse commonly used in Personal Computers so that electronic computer 10 may be used as a common personal computer. In this form of use, it will be clear that both the buttons depressed and the processed data displayed by television 12 may be recorded by video recorder 13.

Further, electronic computer 10 can be connected by means of connector 63 to a known type monitor, commonly used in Personal Computers. In configurations of this type, both images recorded on PHOTO-CD or VIDEO-CD type CD-ROMs 14 and film clips read with video recorder 13 may be played back on this monitor, without the need for television 12.

It will be readily understood that modifications and changes may be made to the dimensions, shapes, components, circuit elements, connections and contacts, as also to the circuitry and construction details and method of operation of the electronic computer described up to now without in any way departing from the scope of this invention.

CLAIMS

1. An electronic computer (10) comprising a central processing unit (30), a reading unit (21) connected to said central processing unit (30) for reading data pre-recorded on a removable recording medium (14) of different type (AUDIO-CD, PHOTO CD, VIDEO CD), and a display unit (46,47);
5 characterised by a console (11) having a plurality of functional elements (48,49) selectively actuatable for activating/deactivating the functions (Play, Pause, Stop, FF, etc.) of said reading unit (21), and by control means (40) connected to said plurality of functional elements (48,49), to said central
10 processing unit (30), and to said display unit (46,47) for causing said display unit to display information relating to the selected functions of said reading unit (21).
2. An electronic computer (10) according to claim 1, characterised in that said recording medium (14) is a magneto-optic compact disk.
- 15 3. An electronic computer (10) according to claim 1, comprising power management means (31b) connected to said central processing unit (30) for enabling either a full performance operating state or a reduced performance operating state (stand-by) of said electronic computer (10), characterised in that said control means (40) transmit to said central processing unit (30), after
20 a predetermined period of time, a switching signal (SMI) for switching said electronic computer (10) from said full operating state to said reduced operating state, wherein at least said reading unit (21) is set in a stand-by condition.
4. An electronic computer (10) according to claim 1, comprising power
25 management means (31b) connected to said central processing unit (30) for enabling either a full performance operating state or a reduced performance operating state (stand-by) of said electronic computer (10), characterised in that at least one (49) of said functional elements (48,49) is actuatable for transmitting to said central processing unit (30) a switching signal (SMI) for
30 switching said electronic computer (10) from said full operating state to said reduced operating state and viceversa.
5. An electronic computer (10) according to claim 1, characterised by recognition means (31a) connected to said central processing unit (30) for

recognising the type (AUDIO-CD, PHOTO CD, VIDEO CD) of the removable recording medium (14) inserted in said reading unit (21), said control means (40) being able to cause said display unit to display information relating to the type (AUDIO-CD, PHOTO CD, VIDEO CD) of removable recording medium (14) recognised by said recognition means (31a).

6. An electronic computer (10) according to claim 5, characterised in that said control means (40) associate to each one of said functional elements (48,49) a predetermined function (Play,Pause,Stop,FF,etc.) of said reading unit (21), which function is determined on the basis of the type (AUDIO-CD, PHOTO CD, VIDEO CD) of removable recording medium (14) recognised by said recognition means (31a).

7. An electronic computer (10) according to claim 1, characterised in that said display unit (46,47) is mounted on said console (11) and in that said electronic computer (10) further comprises communication means (16,18,35) connected to a further display unit (12) in order to playback said pre-recorded data and/or display data processed by said central processing unit (30).

8. An electronic computer (10) according to claim 7, characterised in that said communication means (16,18,35) are connected to a video recorder unit (13) and in that said communication means (16,18,35) are controlled by said central processing unit (30) to selectively record on said video recorder unit (13) the data pre-recorded on said removable recording medium (14) and/or the data processed by said central processing unit (30).

9. A system for the electronic processing of information, comprising an electronic computer (10) having at least a reading unit (21) for reading data pre-recorded on a magneto-optic compact disk (14) of different type (AUDIO-CD, PHOTO CD, VIDEO CD), and a display unit (12) connected to said electronic computer (10) through communication means (16,18,35) to playback said pre-recorded data and/or display data processed by said electronic computer (10), characterised in that said electronic computer (10) further comprises a console (11) having a plurality of functional elements (48,49) actuatable for activating/deactivating the functions (Play,Pause,Stop,FF,etc.) of said reading unit (21), and a further display unit (46,47) for displaying information relating to the type (AUDIO-CD, PHOTO CD,

VIDEO CD) of said magneto-optic compact disk (14) and/or the actuated functional elements (48,49).

5 10. A system for the electronic processing of information according to claim 9, characterised in that each one of said functional elements (48,49) is associated with a function (Play, Pause, Stop, FF, etc.) of said reading unit (21) in accordance with the type (AUDIO-CD, PHOTO CD, VIDEO CD) of magneto-optic compact disk (14) inserted into said reading unit (21).

10 11. A system for the electronic processing of information according to claim 9, characterised in that at least one (49) of said functional elements (48,49) is actuatable for switching said electronic computer from a full performance operating state to a reduced performance operating state (stand-by) and viceversa.

15 12. A system for the electronic processing of information according to claim 9, characterised in that said system further comprises a video recorder unit (13) connected to said electronic computer (10) through said communication means (16,18,35) in order to selectively record on said video recorder unit (13) the data pre-recorded on said magneto-optic compact disk (14) and/or the data processed by said electronic computer (10).

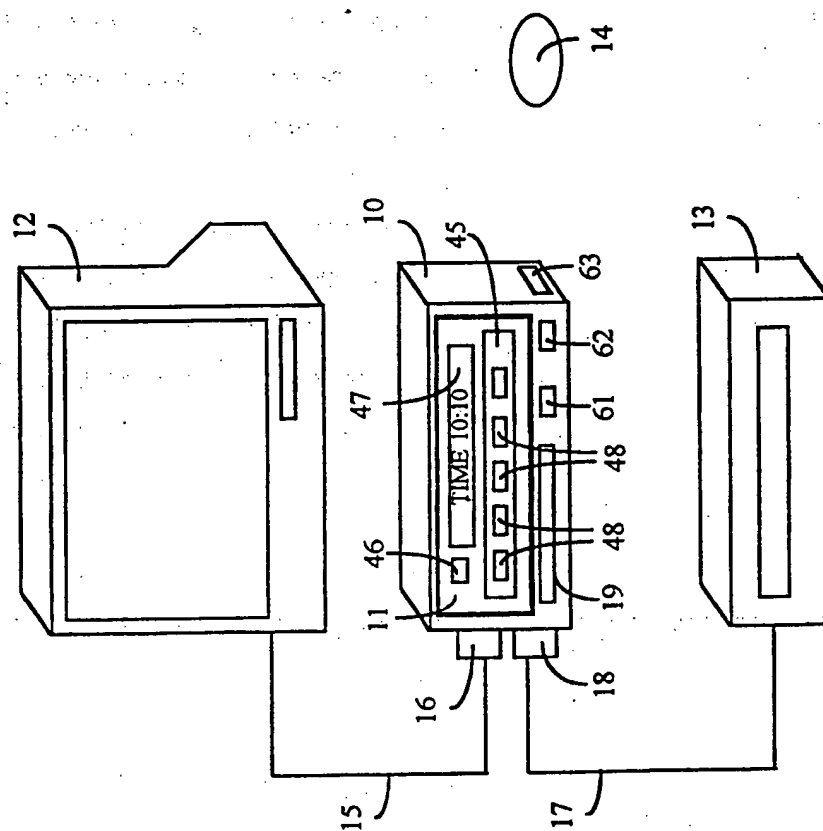


Fig. 1

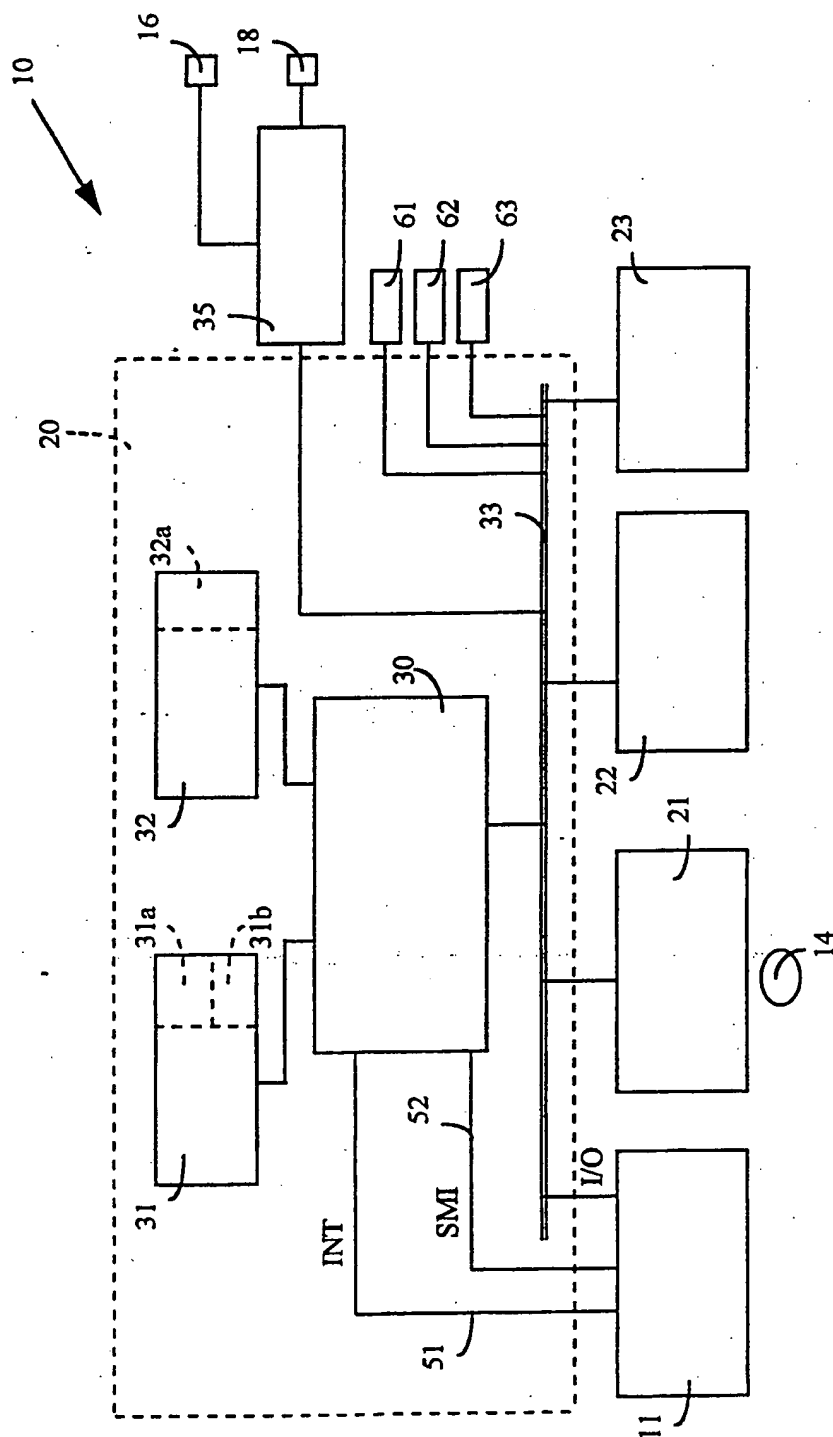


Fig. 2

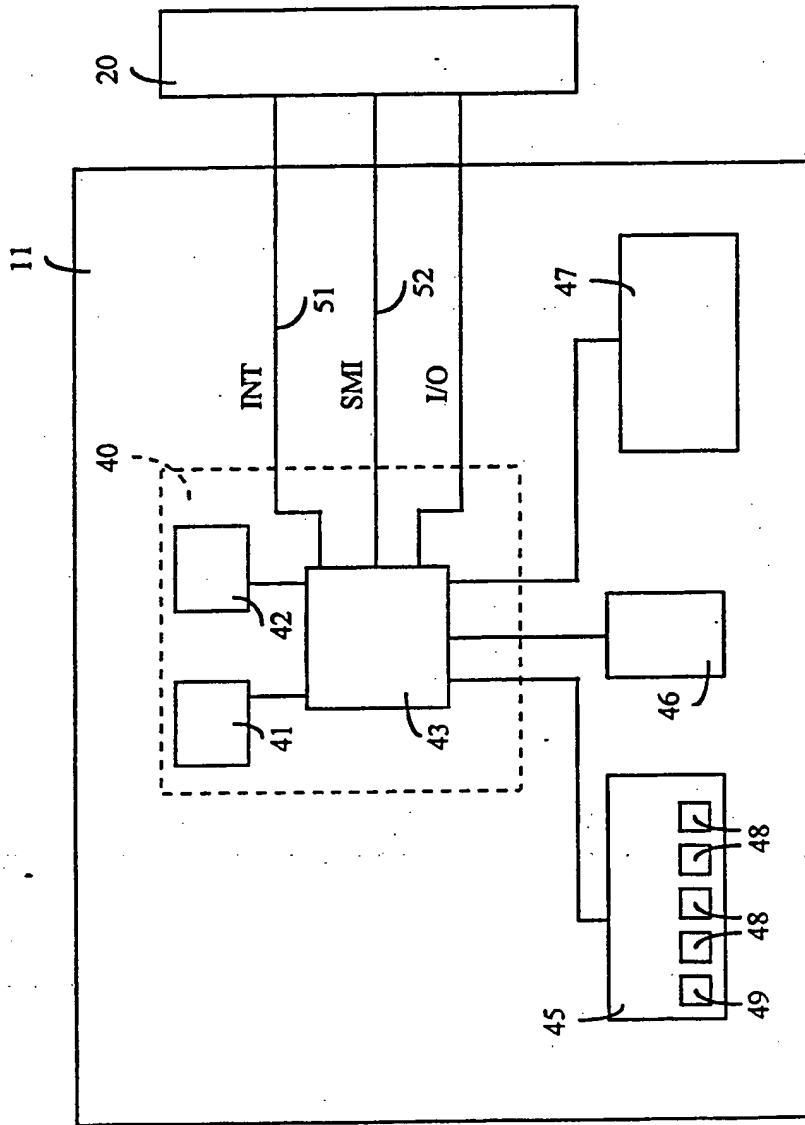


Fig. 3

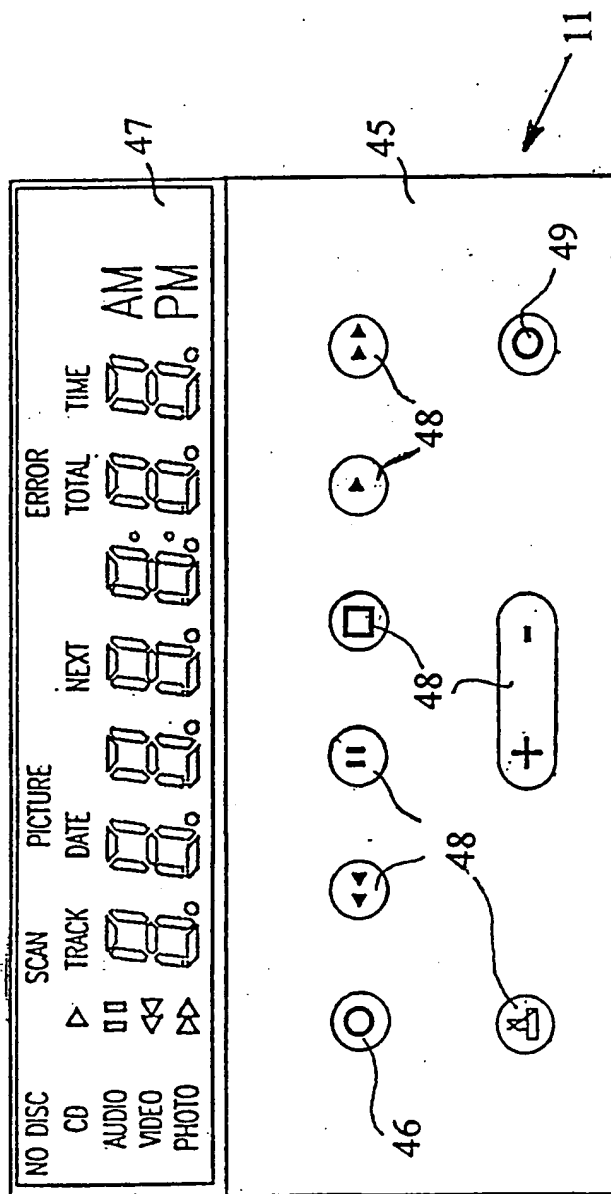


Fig.4

INTERNATIONAL SEARCH REPORT

Inter national Application No
PCT/IT 96/00101

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G11B19/02 G11B19/00 G11B19/06 G11B19/12 G11B31/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 453 108 (PIONEER ELECTRONIC CORP) 23 October 1991 see the whole document ---	1,3, 5-10,12
Y	WO,A,94 20921 (ASYMETRIX CORP) 15 September 1994 see page 6, line 1 - page 7, line 32; figure 1 ---	1,3, 5-10,12
A	EP,A,0 569 244 (PIONEER ELECTRONIC CORP) 10 November 1993 ---	1,5,6,9
A	EP,A,0 495 518 (FUJITSU LTD) 22 July 1992 see the whole document --- -/--	1,2, 5-10,12

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

13 August 1996

Date of mailing of the international search report

3 0. 08. 96

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/IT 96/00101

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International Application No

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